

# **EPA Region 4 Multi-State Pilot Program Area-Wide Optimization Program**

South Carolina Department of Health and Environmental Control

## **2003 Annual Report**

April 2004

<http://www.scdhec.net/water/html/awop.html>

The South Carolina Department of Health and Environmental Control (DHEC) joined the Multi-State Pilot Program and implemented an Area-Wide Optimization Program (AWOP) in 1997. The goal of the program has been to optimize particulate removal at all surface water treatment plants.

In addition to particulate removal, the optimization focus of the Multi-State Area-Wide Optimization Program has expanded to include Disinfection By-Product (DBP) control. States were asked to come up with a priority scoring system for DBP's. Included with this report are data for surface water systems that serve over 10,000 people (data was only available for large systems).

The following report contains a summary of plant data for 2003, a few brief success stories, a review of DHEC optimization activities, and conclusions based on the data. The format of the report follows the AWOP Model; status, evaluation, follow-up, and maintenance components.

### **Microbial Status Component**

The 2003 turbidity data for all South Carolina surface water treatment plants (58 plants) have been updated. Several plants have shown improvement since the 2002 annual report.

As shown with the past annual reports, South Carolina continues to show microbial optimization success at our surface water treatment plants. An initial priority list was compiled of the ten worst performing plants in 1997. Optimization efforts were then focused on these ten. Because several of those plants have shut down, a new list was compiled in 2002. The table below shows the new priority list and performance numbers from 2002 and 2003.

**Surface Water Treatment Plant Rankings in 2003**

<b>2002 Rank</b>	<b>Raw Average</b>		<b>Settled 95<sup>th</sup></b>		<b>Filtered 95<sup>th</sup></b>	
	<b>2002</b>	<b>2003</b>	<b>2002</b>	<b>2003</b>	<b>2002</b>	<b>2003</b>
1	21	Offline	5	Offline	0.44	Offline
2	2	Offline	2	Offline	0.38	Offline
3	8	5	2	2	0.47	0.49
4	24	26	2	2	0.35	0.22
5	6	8	2	2	0.32	0.30
6	4	10	0.33	1	0.19	0.20
7	26	37	7	9	0.14	0.10
8	40	41	6	6	0.22	0.40
9	7	17	2	3	0.17	0.11
10	5	8	1	1	0.16	0.17

Notes: Plant rankings are out of 58 plants. 1 is worst, 58 is best.

The optimization program is discussed during the annual sanitary survey at each surface water treatment plant. Charts and data are presented and discussed for the time period since the last survey of that water system. In some cases, this annual discussion alone has resulted in plant improvements.

Each year there have been several success stories. Success stories are plants that have significantly improved their performance since the start of the Program. There are many plants that could be discussed, but only the more significant improvements are presented in this report.

#### City of North Augusta

The City of North Augusta WTP significantly improved their performance between 2002 and 2003. The plant has a regulated capacity of 25 MGD and serves approximately 27,000 people. In 2002, there were 6 days when the settled water turbidity was over 1 NTU and 18 days when the filtered water turbidity was over 0.1 NTU. In 2003, there were 7 days when the settled water turbidity was greater than 1 NTU and no days when the filtered water turbidity was greater than 0.1 NTU. The following chart shows their performance over the last 4 years for settled and filtered water turbidities.

<b>City of North Augusta</b>		
<b>Year</b>	<b>Settled 95<sup>th</sup> (NTU)</b>	<b>Filtered 95<sup>th</sup> (NTU)</b>
2000	1.05	0.15
2001	1.07	0.11
2002	0.9	0.10
2003	1.32	0.06
<b>Percent Improvement (2000-2003)</b>		<b>60 %</b>

#### City of Newberry

The City of Newberry improved their performance between 2002 and 2003. The plant has a regulated capacity of 8.1 MGD and serves approximately 23,000 people. In 2002, there were 16 days when the settled water turbidity was over 1 NTU and 14 days when the filtered water turbidity was over 0.1 NTU. In 2003, there were 14 days when the settled water was greater than 1 NTU and 9 days when the filtered water turbidity was greater than 0.10 NTU.

<b>City of Newberry</b>		
<b>Year</b>	<b>Settled 95<sup>th</sup> (NTU)</b>	<b>Filtered 95<sup>th</sup> (NTU)</b>
2000	1.76	0.29
2001	1.11	0.07
2002	1.12	0.10
2003	1.35	0.06
<b>Percent Improvement (2000-2003)</b>		<b>79 %</b>

### Catawba River WTP

The Catawba River WTP has shown significant performance improvement between 2000 and 2003. The plant is rated for 36 MGD at a filtration rate of 6 gpm/ft<sup>2</sup>. The water plant wholesales treated water to two counties, Union County North Carolina, and Lancaster County South Carolina. The water system serves approximately 100,000 people.

In 2002, there were 14 days when the settled water was greater than 1 NTU and 100 days when the filtered turbidity was greater than 0.1 NTU. In 2003, there were 8 days when settled turbidity was greater than 1 NTU and 4 days when the filtered turbidity was greater than 0.1 NTU. The following table illustrates the plant performance.

<b>Catawba River WTP</b>		
<b>Year</b>	<b>Settled 95<sup>th</sup> (NTU)</b>	<b>Filtered 95<sup>th</sup> (NTU)</b>
2000	2.3	0.24
2001	1.55	0.22
2002	1.33	0.25
2003	1.22	0.10
<b>Percent Improvement (2000-2003)</b>		<b>58%</b>

These success stories help to illustrate the overall effectiveness of the Area-Wide Optimization Program in South Carolina. There are many other surface water systems that have made improvements in their performance. Several water systems were already meeting or exceeding the goals of the program and were not mentioned.

### Microbial Summary

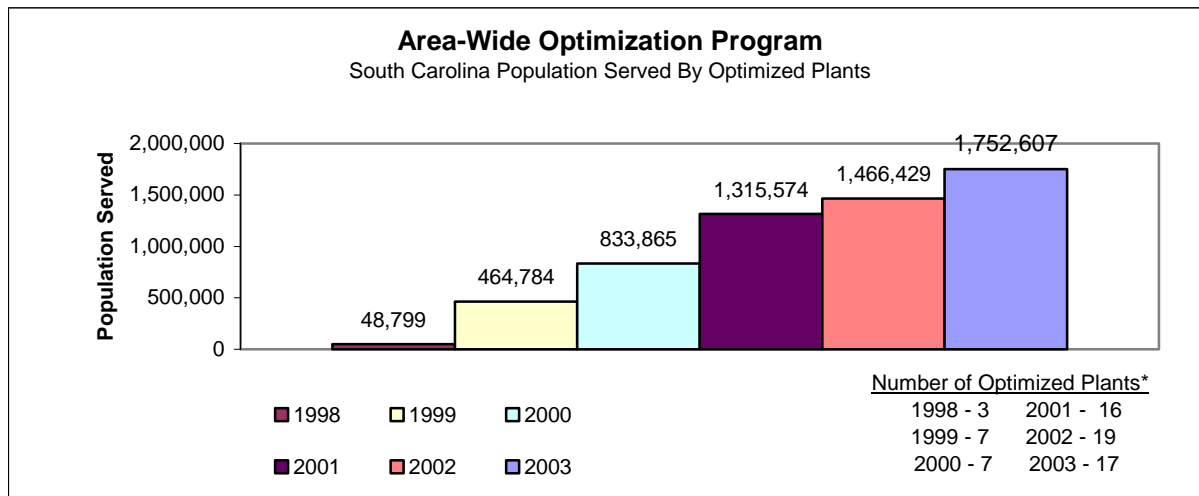
Each year, an increasing number of systems have achieved optimized performance. In 2003, 17 plants met both goals. This has increased from only 7 in 2000. The table below shows how many plants met the goals each year.

<b>Plants Meeting Performance Goals</b>	
<b>Year</b>	<b># Plants</b>
2000	7
2001	16
2002	19
2003	17

Recently, the US EPA has started focusing attention nationally on the successes achieved by the Region 4 pilot program. One aspect of optimization success that headquarters of EPA has emphasized is the number of people served by plants with optimized performance. This year, for the first time, data was compiled to reflect this emphasis.

### 2003 SC Population Served vs. Filtered Water Turbidity Ranges

Filtered Water (NTU)	Number of Plants	Population Served
< 0.10	23	1,466,522
0.11 to 0.20	25	781,940
0.21 to 0.30	2	37,172
0.31 to 0.5	2	8,000
> 0.5	0	0
Total Population Served by SWTP's		2,293,634



\*Industries excluded

The above table and chart shows the breakdown by filtered water turbidity ranges and population served by optimized plants by year. The population served by optimized plants (met settled & filtered goal) was 315 thousand in 1997 and 1.7 million in 2002. The 1.4 million is approximately 64% of the population that is served by surface water.

**Settled Water Goal** – Of the 58 surface water systems in South Carolina, 35 met the settled water turbidity goal.

**Filtered Water Goal** – Of the 58 surface water systems in South Carolina, 23 met the filtered water turbidity goal.

### **Disinfection By-Product Status Component**

The initial Disinfection By-Products (DBP) status component has been completed for 2003. During the July 2003 quarterly meeting in Birmingham, AL, it was decided that each of the States would try to come up with a ranking and scoring system for DBP's that was similar to the microbial/turbidity rankings that each state uses. These DBP status components are needed to help each State determine where to focus technical assistance efforts to help systems that are having trouble meeting the DBP regulatory limits. During the Panama City, FL quarterly meeting in December 2003, there was a lengthy discussion about where the DBP goals should be set. The level at which systems are considered optimized for DBP's has yet to be finalized.

Spreadsheets were developed for each surface water plant in order to track THM & HAA MCL's and 95<sup>th</sup> percentiles, TOC levels, and a scoring system. The scoring system is shown below. Similar to the turbidity scoring, the DBP scoring takes into account regulatory compliance, sanitary survey ratings, and system performance with respect to DBP's.

Prioritization of Surface Water Systems for Disinfection By-Products					
System Name					
Regulatory Compliance for the past 2 years				Points	
# Acute MRDL violations (chlorine diox)				80	
# MCL Violations				40	
# MRDL Violations				20	
# Treatment Technique Violations				20	
# Quarterly averages above TTHM MCL				20	
# Quarterly averages above HAA5 MCL				20	
Sanitary Survey Results for Most Recent 2 Surveys					
# Overall Unsatisfactory Ratings				40	
# Overall Needs Improvement Ratings				20	
# Individual items (distribution-related) Rated Unsat.				10	
# Individual items (distribution-related) Rated Needs Improvements				5	
Operational Performance Data Based on 1 Year (Locational Samples)					
TTHM Performance		Points		HAA5 Performance	Points
TTHM greater than 100		80		HAA5 greater than 75	80
TTHM between 80 & 100		60		HAA5 between 60 & 75	60
TTHM between 60 & 80		40		HAA5 between 45 & 60	40
TTHM between 40 & 60		20		HAA5 between 30 & 45	20
TTHM below 40		0		HAA5 less than 30	0
TOC Performance					
# Months ratio less than 0.9		50			
# Months ratio between 0.9 & 1.0		25			
# Months ratio is 1.0 or higher (or alt. used)		0			

Even though all data has been input and analyzed, there are a couple of limitations to the data set. All of the systems that serve less than 10,000 people had neither THM & HAA results nor TOC results available. These systems did not start sampling for these parameters until January of 2004. Although the level at which plants are considered optimized is still being finalized, there were several important conclusions that can be drawn from the data. First, during the spring of 2003, there was above normal precipitation that resulted in flushing out of a lot of watersheds. This led to increased TOC loadings in source waters and a subsequent rise in THM's and HAA's. Second, those systems that had good scores for the microbial status component also tended to have good scores for the DBP status component (fewer problems). A summary table is shown below.

#### **TTHM & HAA5 Data Summary (All 54 systems)**

<b>TTHM Data</b>		
<b>Range (mg/L)</b>	<b>RAA (# systems)</b>	<b>95<sup>th</sup> % # systems</b>
Over 100	2	15
80 – 100	3	8
40 – 80	29	25
Below 40	17	5

<b>HAA5 Data</b>		
<b>Range (mg/L)</b>	<b>RAA (# systems)</b>	<b>95<sup>th</sup> % # systems</b>
Over 80	5	16
60 – 80	3	19
30 – 60	37	15
Below 30	8	3

#### **TTHM & HAA5 Data Summary (13 Systems less than 10,000)**

<b>TTHM Data</b>		
<b>Range (mg/L)</b>	<b>RAA (# systems)</b>	<b>95<sup>th</sup> % # systems</b>
Over 100	1	6
80 – 100	6	2
40 – 80	5	4
Below 40	1	1

<b>HAA5 Data</b>		
<b>Range (mg/L)</b>	<b>RAA (# systems)</b>	<b>95<sup>th</sup> % # systems</b>
Over 80	3	4
60 – 80	2	6
30 – 60	7	2
Below 30	1	1

#### **Evaluation Component**

There are several tools used in the evaluation component of the AWOP Model. Sanitary surveys are an excellent tool for discussing a plants optimization performance. The CPE is another important evaluation component tool. After the status component is completed each year, staff members can determine which plant or plants would be benefited by having a CPE performed.

#### **Follow-up Component**

Once all of the participating states had developed their status and evaluation components, the group began development of the follow-up component. The major tool used in the follow-up component is performance-based training, or PBT. The training is comprised of several centralized training events with hands on activities followed by facilitation activities. The focus of the training is to transfer optimization skills to plant operators and encourage them use what they learn to optimize their plants. PBT is

implemented with multiple utilities simultaneously in order to foster both partnering and competition between the utilities.

Currently, DHEC is working on finishing a second round of PBT. Chester Metro, Camden, and Rock Hill have all been through 3 of the 5 sessions. Each of the participating water systems has continued to show successes. Special studies have been discussed and implemented at the plants.

### **Maintenance Component**

The maintenance component will incorporate AWOP activities into other job activities. Some examples of this are design review, staff training, funding, etc. Optimization standards are applied to proposed new facilities during the permit review process. In addition, when a water plant wants to use high-rate filtration (greater than 4.0 gpm/ft<sup>2</sup>) they must complete a 12-month study. When the study is completed, data is reviewed with respect to the optimization goals and sometimes high-rate filtration is not approved based on not meeting the optimization goals.

### **2003 AWOP Activities**

1. CPE's attended: Cornelia, GA, Monroe, NC
2. Performance Based Training:  
Round 2 – Chester Metro, Camden, Rock Hill
3. Quarterly meetings attended: Monroe, Birmingham, Panama City.
4. AWOP Presentations given:  
ASDWA National Conference, Boston  
DHEC Annual SWTP meeting  
(Attended by R4 EPA) (3 pres. given)  
DHEC Board Meeting  
State Drinking Water Directors Meeting  
DHEC Monthly Informational Exchange mtg.  
Spartanburg WTP Optimization Workshop
5. Publications: Articles written about AWOP in DHEC publication Newsleak, AWOP included in EPA mid-year and end of year reports, DHEC AWOP website continually updated.
6. Other activities: Filter assessment technical assistance; Jar testing technical assistance, Discussion of AWOP during plant sanitary surveys

### **Conclusions**

South Carolina DHEC drinking water staff remains very active in the Program and continually provides support to other states. All staff members and upper management consider the Program a success and look forward to improved results in the future.